RECORD OF DECISION

FOR REMEDIATION OF THE WALKER MINE TAILINGS

BECKWOURTH RANGER DISTRICT, PLUMAS NATIONAL FOREST

April, 1994

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FOR REMEDIATION OF THE WALKER MINE TAILINGS

PLUMAS NATIONAL FOREST

PLUMAS COUNTY, CALIFORNIA

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WALKER MINE TAILINGS

PLUMAS NATIONAL FOREST

PLUMAS COUNTY, CALIFORNIA

Site Name and Location

The Walker Mine Tailings are located on National Forest System land approximately 15 miles east of the Plumas County community of Quincy in Section 12, T24N, R11E; and Sections 7 and 18, T24N, R12E; Mt. Diablo Baseline and Meridian. The 100-acre tailings area is downstream of Walker Mine, which is located on patented land, and at the confluence of Dolly Creek and Little Grizzly Creek.

Statement of Basis and Purpose

This decision document represents the selected remedial action for the treatment of the Walker Mine Tailings area developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the National Contingency Plan (NCP). This decision is based on the administrative record for this site. The State of California, Plumas County, most of the public, and Atlantic Richfield Company (a Potential Responsible Party) is in agreement with the selected remedy.

Assessment of the Site

Actual or threatened release of hazardous substances from the site, if not addressed by implementing the response action selected in this Record of Decision (ROD), will present an imminent and substantial endangerment to public health, welfare or the environment.

Description of the Selected Remedy

This ROD for the Walker Mine Tailings includes the following actions to address existing and future contamination:

- Treat the tailings material on-site. Removal of all or part of the material is not proposed.

- Reconstruct 1500 feet of Dolly Creek channel to a stable geometry and revegetate its banks, including the larger gully banks.

- Construct a 15-acre passive water treatment system (wetland) in the lower portion of Dolly Creek. This will include raising the sediment dam approximately one foot.

- Construct wind barriers on 50 acres of the tailings surface.

- Neutralize 10 acres of low pH material with crushed limestone.

- Revegetate 60 acres of tailings area with grasses, shrubs, and trees.

- Close the site to public access where needed to protect treatment features.

- Monitor for success and compliance with Applicable, Relevant and Appropriate Requirements (ARARs).

Declaration

The selected remedy is protective of human health and the environment, meets Federal and State requirements that are applicable, relevant and appropriate to this remedial action and is cost-effective. The remedy satisfies the statutory preferences for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes permanent solutions to the maximum extent practicable. The remedy meets requirements provided by the State of California.

MELROY H. TEIGEN
Acting Director, Engineering
Pacific Southwest Region

6/10/94
Date

DECISION SUMMARY

I. Site Name and Location

The Walker Mine Tailings are located on National Forest land approximately 15 miles east of the Plumas County community of Quincy in Section 12, T24N, R11E; and Sections 7 and 18, T24N, R12E; Mt. Diablo Baseline and Meridian (Figure 1).

At an elevation of 5750 feet mean sea level, the tailings area is at the confluence of Dolly Creek and Little Grizzly Creek, tributary to Indian Creek, then the East Branch North Fork Feather River. Dolly Creek flows from northeast to southwest from near the Walker Mine and across the tailings area. Little Grizzly Creek flows along the southern edge of the tailings area from southeast to northwest (Figures 2 and 3).

II. Site Description, History and CERCLA Response Actions

The Walker Mine, located on patented lands, produced copper and minor quantities of gold and silver from 1915 through 1941. The 1941 operation was shut down and has since remained idle except for occasional exploration activities.

The tailings area is located in a natural basin three-quarters of a mile southwest and downstream of the Walker Mine on Dolly Creek at its confluence with Little Grizzly Creek. The tailings were produced as a slurry at the mill located at the mine site. This slurry flowed by gravity to the tailings site where it was impounded by a small dam on Dolly Creek. Much of the free water from the milling process evaporated, leaving behind a well distributed pile of fine-grained, sandy, silty, and clay-like tailings material covering an area of approximately 100 acres to an average depth of 28 feet (based on borings made in 1992).

The Walker Mine has a long history of pollution, acid mine drainage, heavy metals contamination, and noncompliance with Waste Discharge Requirements (WDRs) established by the California Regional Water Quality Control Board, Central Valley Region (CVRWQCB). In 1987, the CVRWQCB retained an engineering contractor to design and install a concrete seal in the mine tunnel to minimize acid mine drainage and discharge of heavy metals into waters from the mine. The seal appears to be effective in reducing mine discharge into the nearest receiving water, Dolly Creek, then Little Grizzly Creek. See Figure 2 for a summary of the current affectiveness of the mine seal.

The Walker Mine Tailings also adversely affect the water quality of Dolly Creek and Little Grizzly Creek. Dolly Creek, and any remaining drainage from the Walker Mine, flow from northwest to southwest along the northern portion of the tailings, picking up leachate water and resulting in release of tailings, heavy metals (copper, iron, and zinc), and turbid water to the receiving waters. In 1958 the CVRWQCB adopted Resolution No. 58-181 prescribing discharge requirements for the tailings, and named the USFS and the owners of the Walker Mine as the dischargers. In 1986 the CVRWQCB rescinded Resolution No. 58-181 and issued WDRs Order No. 86-073, naming the USFS as the sole discharger. New WDRs were issued in 1991 and Resolution No. 91-017 was adopted. Maximum receiving water quality criteria for the compliance station on Little Grizzly Creek, downstream of the Walker Mine Tailings were established.

The Walker Mine tailings site was placed on the Federal Agency Hazardous Waste Compliance Docket ("the docket"), pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 42 USC 9620 (c)) by the U.S. Environmental Protection Agency (EPA) in 1991.

A site investigation was started in 1990 and completed in 1992 with the installation of monitoring wells and a waste characterization program. the 1990-1991 investigation focused on the release and transport of copper and sediment from the tailings and the development of alternatives for stabilizing and reclaiming the tailings area. Included in the study was an investigation and preliminary assessment of health risks to forest users and workers at the site.

Other contamination pathways, such as groundwater, were studied and determined to be insignificant or non-existent, although questions still remain because of increased concentrations of copper detected in Little Grizzly Creek between the confluence with Dolly Creek and the Brown's Cabin monitoring site.

III. Community Relations

Community relations were initiated in 1989 when the East Branch North Fork Feather River Coordinated Resource Management group (EBNFFR CRM) added the treatment of the Walker Mine Tailings into their water quality improvement program. The EBNFFR CRM is a formal partnership that includes 19 local, state and federal agencies plus private land owners and the Pacific Gas and Electric Company. The primary goal of the EBNFFR CRM is water quality improvement in the East Branch North Fork Feather River.

A formal public involvement plan was initiated in September 1991, to facilitate public involvement with the proposed project. The public includes the EBNFFR CRM, local, State and Federal agencies, interested and affected individuals and groups, and Potential Responsible Parties (PRPs). Communications included direct mailings, newspaper notices, news releases, and public meetings. Interested parties also became informed and involved through personal communications.

Public support for the project has been positive, except for a few people who use the site as a "playground" with their off-highway vehicles (OHV). Support from the various government agencies has also been positive.

The primary support agency has been the CVRWQCB. United States Forest Service (USFS) personnel and water quality engineers for the State agency have worked closely to analyze the site and develop treatment alternatives.

The PRPs have been identified and requested to participate in the planning process. Little response has been received until lately, when the Atlantic Richfield Company (ARCO) was identified in 1993. ARCO responded immediately and positively (See Appendix).

Copies of all relevant documents have been sent to interested parties, the CVRWQCB, and PRPs. Comments on the draft documents were solicited. The Proposed Plan for remediation of the site was also handled in this way.

Very little public interest has been demonstrated. Homeowners in Genessee Valley, downstream from the tailings area have informally expressed their support of the proposed treatments, as have other interested parties.

Recreation users of the site, as mentioned above, have informally expressed their desire to leave the site as it is and allow them to continue to use the area for off-highway vehicle use.

Mr. Leroy Pedersen of Four Hills Mining Company has made numerous contacts with the USFS regarding the treatment of the tailings material. He is working with a patented process to treat tailings material containing high amounts of silica, removing the metals and the silica. Further testing of the process is required before it can be evaluated and approved for use. If this or any process is found to be a desirable remedy for the site in the future, there is nothing in the proposed treatment that will preclude their use and effectiveness.

No response has been received from Mr. Henry R. Barry, CEO, Calicopia Corporation, owners of the Walker Mine and a Potential Responsible Party (PRP) for remediation of the tailings area. The latest mailing to Mr. Barry resulted in a return mailing and no forwarding address. Efforts to locate him suggest that he is no longer in the country and that Calicopia Corporation no longer exists.

Three PRPs hold mining claims on the tailings area. No work has been performed by them, except for a minimal amount of exploratory work. Contact was made with one of the claimants, Mr. Archie Sparkman, who spoke for all of the claimants. They would like to dissolve all interest in the site. They have not paid taxes on the claim for the past three years. Mr. Sparkman said they fully support the treatments that are proposed for the site.

Recently, another PRP has surfaced as a result of research conducted for the USFS by TechLaw Inc. TechLaw has established a fairly solid link between the Walker Mining Company and Anaconda Company. Additionally, TechLaw has substantiated Anaconda Company's relationship to Atlantic Richfield Company (ARCO). The USFS notified ARCO of their potential responsibility and received a positive response with a willingness to participate in remediation efforts to the limit of their liabilities, which still needs to be determined. They have also responded in support of the proposed treatments for the site, stating that they believe them to be very practical and reasonable.

IV. Site Characteristics

Where Dolly Creek flows across the tailings area, the upper channel section has incised 20 feet through the tailings material to native soil. It is here where most of the sediment enters Dolly Creek for transport downstream. Water is the primary agent eroding the tailings material to the streams, although wind drives a significant amount of tailings material from the surface of the tailings to the gully banks, where it is then picked up by flowing water. Below this incised section, Dolly Creek becomes braided and is dominated by alluviation and continuous bed movement. Some natural wetland development is occurring in this area. The base level is controlled by a sediment retention dam constructed originally by the operators of the Walker Mine and then reconstructed in 1979 by the USFS.

The beneficial uses of the water from Dolly Creek and Little Grizzly Creek are:

1. Agricultural water supply.

2. Recreation.

3. Aesthetic enjoyment.

4. Preservation and enhancement of fish, wildlife, and other aquatic resources.

Downstream beneficial uses of the Feather River include:

1. Municipal water supply.

2. Industrial water supply.

3. Ground water recharge.

4. Hydroelectric power generation.

The mean annual precipitation for the area is about 40 inches, with a significant portion in the form of snow. The mean minimum temperatures at the site for the months of January and July are 16 degrees Fahrenheit and 42 degrees Fahrenheit, respectively. Surface runoff usually results from snowmelt, but fall and spring rains and summer thundershowers are also common.

Vegetation in the vicinity of the mine and tailings area consists largely of mixed conifer forest. The tailings area is mostly nonvegetated but does support locally vegetated areas containing rushes in low-lying areas, islands of pines and shrubs, and islands of sedges along Dolly Creek. Because of this general lack of vegetation, moisture levels in the tailings material rarely drops below field capacity even during the summer months. Only the top three to six inches completely dries out.

Groundwater in the surrounding area is found in seasonal shallow or perched aquifers (decomposed granite) mantling bedrock surfaces or fractured-rock aquifers formed by the interconnected joints and fractures in the bedrock. Ground water in the tailings area is controlled primarily by the elevation of the sediment dam, but does reflect moisture conditions during winter and summer months. During the monitoring well installation in October, 1992, water elevations averaged 5.73 feet below the surface of the tailings material, ranging from 0.40 feet to 17.23 feet below the tailings surface.

The tailings aquifer is recharged by snow and rain falling onto the tailings area, by several springs surrounding the site and possibly buried by the tailings material, by conveyance along the original Little Grizzly Creek channel (now buried by tailings material), and directly by Dolly Creek as it flows across the tailings area. Discharge occurs by evaporation from the surface, by seepage along the base of the levee separating Little Grizzly Creek from the tailings material, by surface and seepage flow over and through the sediment retention dam, and, possibly, by seepage through rock fractures and the original Little Grizzly Creek channel.

V. Risk Assessment Summary

Copper, iron and zinc are continually released into Dolly Creek and Little Grizzly Creek through a variety of pathways, exposing aquatic organisms to lethal or otherwise stressful concentrations of these metals. These organisms have been shown to be either killed outright or their life cycles affected to such a degree that they cannot maintain viable and productive populations. Approximately 3800 feet of Dolly Creek and about one mile of Little Grizzly Creek are affected by the contaminants released from the tailings. Within that one-mile section of Little Grizzly Creek, dilution and biological uptake reduce contaminant concentrations to near background levels.

Human health is potentially affected when dust emanating from the tailings area is inhaled. The respirable free silica is crystalline in form and can cause silicosis and lung cancer, especially under occupational exposure for several years. Concentrations of metals in the tailings material known to cause human health problems have been identified, but are at levels in the surface material that is indistinguishable from soils at background sites. Table 1 displays metals found in the tailings material at well sites and bore holes. Table 2 displays metals released into the waters of Dolly Creek (Station R1, above the tails; and Station R2, below the tails) and Little Grizzly Creek (Station R3, above the tails; Station R4 below the tails; and Station R5, the compliance station located below the confluence with Dolly Creek). Station R6 is an overflow pipe located near the middle of the tailings area and next to Little Grizzly Creek. Refer to Figure 4.

Metals found in the tailings material, but not released into the environment in amounts detrimental to human health or the environment include:

Arsenic	Barium	Cobalt	Chromium
Iron	Lead	Mercury	Nickel
Silver	Thorium	Vanadium	

The primary land and resource uses in the area include timber harvesting, mining and recreation. Downstream uses include recreation, fishing, and irrigation of pasture land at the mouth of Little Grizzly Creek. There are no known diversions of water for domestic purposes.

Human exposure to dust is limited to recreational use of the site and to workers in and around the site. Recreation on the site is primarily OHV use. This activity causes large amounts of the tailings material to become airborne, especially where these vehicles are concentrated. Wind also causes large amounts of the tailings material to become airborne, often making it difficult to see and breath.

In addition, wind erosion affects the surface of the tailings area on a daily basis during the growing season. Plants emerging on the site are sheared, buried, or eroded away. The lack of nutrients for plant growth makes it difficult for all but the hardiest plants, usually pioneering varieties, to emerge in the first place.

Towards the end of the mining and milling operations at Walker Mine, ore was incompletely processed then discharged into Dolly Creek to flow freely downstream to the tailings dump. The areas of the tailings covered by this

material are distinctly different from the rest of the tailings area. These areas are limiting plant growth due to acidic conditions, increased solubility of metal ions, elevated levels of iron, and deficiency of sulphur, calcium, and molybdenum. Molybdenum is required by many pioneer species, especially legumes which typically will not grow without sufficient molybdenum for nitrogen fixation.

Most of the tailings material is affected by a lack of similar nutrient chemistry. This includes both macronutrients (nitrogen, phosphorous, potassium, sulfur, calcium, and magnesium) and micronutrients (manganese, boron, and molybdenum). There is a general low level of nitrogen, phosphorous, iron, and molybdenum. The obvious lack of organic matter, necessary for cation exchange, limits the uptake of nutrients. For the purposes of plant growth, all of the tailings are deficient in all of the major plant nutrient cations (potassium, calcium, and magnesium).

Since treatment of the tailings is proposed on-site and none of it removed, there is a risk that treatments may not be fully successful and release of contaminants could continue above levels described in section VII, Remedial Action Goals and Objectives.

VI. Applicable or Relevant and Appropriate Requirements (ARARs) Analysis

Any alternative should comply with applicable or relevant and appropriate requirements (ARARs). The Environmental Protection Agency (EPA) determined that this site does not warrant placement on the National Priorities List (NPL) by evaluating its hazards and vicinity to human habitations. As a consequence, the site falls under the jurisdiction of California's Environmental Protection Agency and their mandated clean-up standards.

Requirements applicable or relevant and appropriate to the site have been identified through formal communication and consultation with the California State Attorney General, and the CVRWQCB, plus other relevant State and local agencies. None of the ARARs listed have been waived.

Identified ARARs are as follows:

1. **State Water Board Resolution 68-16 (anti-degradation policy):**

This resolution satisfies the Federal Clean Water Act anti-degradation policy requirement.

It requires the continued maintenance of high quality waters of the State even where that quality is better than needed to protect beneficial uses, unless specific findings are made.

Water quality may not be allowed to be degraded below what is necessary to protect beneficial uses in any case.

2. **Order No. 91-017. Waste Discharge Requirements (WDR) for the U.S. Department of Agriculture, Forest Service, Plumas National Forest, Walker Mine Tailings, Plumas County:**

A. Discharge specifications (water over the dam and from the culvert):

1. Neither the treatment nor the discharge shall cause a pollution or nuisance as defined in Section 13050 of the California Water Code.

2. The discharge shall not cause degradation of any water supply.

3. The discharge shall not have a pH less than 6.5 nor greater than 8.5.

4. The discharge shall not contain more than 0.2 ml/l settleable solids.

B. Sludge and Solid Waste Disposal:

1. Sludge and/or solid wastes generated by remediation activities shall only be discharged to a waste management unit which is in compliance with the requirements of Title 23, Division 3, Chapter 15, California Code of Regulations (CCR), or to a site(s) which has been approved by the Executive Officer.

2. The Discharger may propose alternative sludge or solid waste disposal alternatives if the waste is to be treated. Disposal of treated waste must comply with Chapter 15 requirements and be approved by the Executive Officer.

C. Receiving Water Limitations:

1. The discharge(s) shall not cause concentrations in Little Grizzly Creek, at a point immediately above Road 25N42 and above the west side spring discharge (R-5) to exceed the following limits:

Constituents	Units	Limitation*
Aluminum	ug/l	750.00
Cadmium	ug/l	1.80
Copper	ug/l	9.22
Iron	ug/l	1000.00
Lead	ug/l	33.80
Mercury	ug/l	2.40
Zinc	ug/l	65.00

*** [Copper and zinc are the only constituents presently detected at the water monitoring stations. Copper and zinc are synergetic in their effects to aquatic organisms. The current goal of remedial actions at the site is to reduce the release of copper and zinc (Cu + Zn) to 10 mg/l, or less, at hardness of 50 mg/L $CaCO_3$.** See Figure 2, Browns Cabin Station.]

Receiving water limitations for cadmium, copper, lead, and zinc are adjusted for hardness at the Little Grizzly Creek upstream station (R-3), according to equations established in the Waste Discharge Requirements Order.

2. The discharge shall not cause visible oil, grease, scum, foam, floating or suspended material in the receiving waters or watercourses.

3. The discharge shall not cause concentrations of any materials in the receiving waters which are deleterious to human, animal, aquatic, or plant life.

4. The discharge shall not cause aesthetically undesirable discoloration of the receiving waters.

5. The discharge shall not cause bottom deposits in the receiving waters.

6. The discharge shall not cause fungus, slimes, or other objectionable growths in the receiving waters.

7. The discharge shall not increase the turbidity of the receiving waters by more than 20% over background levels.

8. The discharge shall not alter the normal ambient pH of the receiving water more than 0.5 units.

3. Crystalline silica dust presents the highest public health concern at the tailings. The Safe Drinking Water and Toxic Enforcement Act of 1986 identifies airborne particles of respirable size, crystalline silica (Chemical Abstracts Services Registry date: October 1, 1988) as known to the State to cause cancer. Although listed, the State of California, Environmental Protection Agency, Department of Toxic Substances Control did not identify any specific air quality ARARs for the site. The Plumas County Department of Environmental Health has provided general comments that it will enforce exposure restrictions upon frequent users and workers at the site by requiring restricted access and/or use of proper respiratory equipment.

VII. Remedial Action Goals and Objectives

GOALS. Protection of the beneficial uses of Little Grizzly Creek from the release of contaminants to the environment (receiving waters) from the tailings area.

Protection of the health of users and workers at the site from the exposure to tailings dust.

OBJECTIVES. To reduce the release of contaminants from the tailings area to Dolly Creek and Little Grizzly Creek by meeting the requirements for receiving water as stated in State Water Board Resolution No. 68-16 (the antidegradation policy requirement), or, if not feasible, the requirements in Waste Discharge Requirements Order No. 91-017 within five (5) years of completion of remediation work.

To eliminate the inhalation of fugitive dust by humans using and working at the site within five (5) years of completion of remediation work.

VIII. Description of Remedial Alternatives

The no action alternative serves as a baseline for comparison of the other alternatives. No action means that no remedial activities will be conducted to reduce or cleanup the hazards associated with the generation and release of

contaminants from the tailings material. Surface and perched groundwater monitoring would be conducted as part of this alternative; however, to quantify the impact associated with a no remedial response action. The site conditions would be re-evaluated periodically to determine whether there have been any changes regarding risk to human health and the environment.

The following is a brief summary of the alternatives considered:

The tailings have been divided into two areas for treatment; (1) Dolly Creek and (2) the remainder of the tailings. The Dolly Creek area includes the active stream channel and the area extending out to, and including, the gully banks.

Treatment alternatives considered, but dropped from the analysis include:

Alternative 6: Covering the tailings area with impermeable material to reduce the amount of oxygen and water that contact sulfide materials. This would be very costly and impractical for this site.

Alternative 7: Actively treating water leaving the site to remove contaminants. This also would be very costly and impractical for this site.

Alternative 8: Use of bactericides to stop the ferric to ferrous transfer. The bacteria to be treated would be found in the upper layers of the tailings material. These bacteria have been found to be, for all practical purposes, non-existent in this area.

Any of these treatments could be revisited if the proposed treatments are found to be ineffective on the site or if new information about the site or these treatments arises.

There are two proposed alternatives, plus the no action alternative, for each of the two areas. The four alternatives considered in detail are summarized below.

Area 1, the Dolly Creek area, would be treated by either Alternative 2 or 3.

Selected

Alternative 2: Channel Erosion Control and Development of a Wetland for Passive Water Treatment.

Under this alternative, Dolly Creek would be stabilized by reconstructing the natural geometry of the channel and revegetating all banks in the upstream portion of the channel and by constructing a wetland in the lower portion. The wetland would not only stabilize the lower portion of Dolly Creek, but it would serve to passively treat contaminated water leaching through the tailings material to Dolly Creek before it flows to Little Grizzly Creek.

Alternative 3: Diversion of Dolly Creek Around the Tailings Area, Stabilization of Dolly Creek Below the Diversion and Passive Water Treatment.

Alternative 3 would include the treatments described above in Alternative 2 plus the diversion of Dolly Creek around the tailings area to Little Grizzly Creek. This would separate the "good" water from the "bad" water. Water from

rain and snow melt plus spring and other groundwater flows would still leach metals from the tailings material to Dolly Creek. Flood flows from the upper watershed area would still pass through the existing Dolly Creek channel on the tailings.

Area 2, the remainder of the tailings area, would be treated by either Alternative 4 or 5.

Alternative 4: Revegetation and Wind Erosion Control.

Alternative 4 would involve modest, low-cost efforts to revegetate the area plus provide wind erosion control measures. The surface of the tailings area is constantly blowing around, inhibiting natural revegetation from occurring. Wind on the area also causes large dust clouds to form, creating a health hazard because it contains large amounts of very fine grained, crystalline silica.

Revegetating the surface of the tailings area is expected to not only eliminate the wind problems over the long-term, but to eventually reduce oxygen in the acid producing, aerated upper layer of the tailings material (the vadose zone), thus reducing the release of contaminating metals to Dolly Creek, and the wetland.

This alternative would use plants that are known to survive conditions existing at the site. Fertilizers would also be used where needed. Mixing plant species such as lodgepole pine and legumes is expected to enhance plant survival. lodgepole pine would provide one of the major tree components and legumes would provide a long-term nitrogen supply to the trees. The underlying principle for successful revegetation of the site is the maximization of plant diversity utilizing plants of known tolerance to the site. This should provide a stable plant community that would require little to no long-term maintenance.

Alternative 5: Vegetated Soil Islands and Wind Erosion Control.

Alternative 5 would employ the same wind erosion control measures as in Alternative 4, but instead of immediately revegetating the entire area, islands of imported soil would be constructed and vegetated. Because covering the entire tailings area with soil was determined to be impractical and too costly, this alternative was developed. The vegetation on these islands would be expected to migrate into unvegetated areas; areas containing no imported soils.

None of the above described treatment alternatives would preclude future treatments that employ improved technologies, providing that they meet treatment objectives and site requirements. Potentially, technologies that would result in total removal and treatment of the tailings material would provide a more permanent solution than the alternatives considered, if cost effective and environmentally acceptable.

IX. Comparative Analysis of Alternatives

Discussion. Each alternative was evaluated using the nine criteria outlined in 40 CFR 300.430, paragraph (e) (9) (iii). These evaluation criteria are as follows: overall protection of human health and the environment; compliance with ARAR's; long-term effectiveness and permanence; reduction of toxicity,

mobility, or volume through treatment; short-term effectiveness; implementability; cost; State acceptance; and community acceptance.

Upon completion of the the detailed analysis of each alternative against each of the nine evaluation criteria, a comparative analysis was conducted that focused on the relative performance of each alternative against those criteria. A preferred treatment was selected and a proposed plan developed and presented for review and comment to the public, State agencies involved with the project, and identified Potential Responsible Parties (PRPs). Two public meetings were held to discuss the proposed plan, one in Portola and one in Taylorsville. Comments were reviewed in consultation with the State in order to determine if the proposed plan is the most appropriate treatment for the site. Changes to the proposed plan are discussed in the following section.

Analysis. There are two areas to be treated, Dolly Creek and the remainder of the tailings area. Alternatives should be combined to provide total site remediation. Alternatives 2 and 3 treat Dolly Creek and its riparian areas and banks. Alternatives 4 and 5 treat the remainder of the tailings area. For this reason, only Alternative 2 and 3 can be compared together and Alternative 4 and 5 compared together. Each alternative and its treatment area are as follows:

	Alternative	Treatment Area
1	No Action	N/A
2	Channel Erosion Control and Developed Wetland	Dolly Creek
3	Alternative 2 plus Diversion of Dolly Creek	Dolly Creek
4	Revegetation and Wind Erosion Control	Remainder of Tails
5	Vegetated Soil Islands and Wind Erosion Control	Remainder of Tails

The following summarizes the comparative analysis using the nine evaluation criteria listed above.

Overall Protection of Human Health and the Environment

The implementation of either Alternative 2 or 3 alone would not provide protection of the health of humans using or working at the site because they are strictly designed to treat the problems associated with the flow of Dolly Creek on the tailings area and contaminants that have leached into Dolly Creek.

The control of wind and water erosion and dust containing respirable crystalline silica would require the implementation of either Alternative 4 or 5. Long-term institutional controls, similar in all alternatives, would provide immediate protection of human health.

All alternatives, except the No Action alternative, reduce contaminant release to some level. Alternatives 2 and 3 would passively treat the waters of Dolly Creek in a wetland environment before it enters Little Grizzly Creek. Alternatives 4 and 5 would reduce oxygen in the vadose zone of the tailings area, thereby reducing contaminant concentrations in the leachate water flowing to Dolly Creek.

The implementation of Alternative 2 or 3 would also stabilize the Dolly Creek channel and gully walls, reducing erosion and sedimentation. Alternative 3

provides exactly the same treatment as Alternative 2 with the addition of a diversion on Dolly Creek upstream of the tailings area and routed around the site to Little Grizzly Creek. This would reduce the amount of water flowing in the Dolly Creek channel located on the tailings area. Water would still flow in the abandoned channel, but at a much reduced rate, along with the leachate water from the tailings material. Passive water treatment would still be relied upon.

An unknown problem would be the reduction of the water table in the tailings material if Dolly Creek is diverted around the tailings area. It is unknown whether or not springs and seeps in the area would maintain the existing water level alone. It is important that the tailings water table be kept as high as possible to limit the amount of tailings material that is exposed to water and oxygen.

Alternatives 4 and 5 would stabilize the remainder of the tailings area. Alternative 4 would result in the immediate revegetation of the site through use of special plant material adapted to the site, fertilizers, some organic material, and wind erosion control. Total vegetation coverage of the site from the implementation of Alternative 4 is expected to occur in approximately 10 years.

Alternative 5 would import soil to form islands to be revegetated. Importing soil to the site would increase costs considerably. It is expected that over time (30 years) this vegetation would spread into the inter-island areas, where wind erosion control measures would be used. Wind erosion control measures would utilize logs, straw, forest debris and "brush trench packs," vegetation, and wind fences. Water erosion would also be minimized by these measures.

Compliance with ARARs

Since Waste Discharge Requirements are not currently being met, the no action alternative cannot meet ARARs. All other alternatives would be expected to meet the specific ARARs they are designed to address.

The implementation of Alternative 2 alone (no upstream diversion) is expected to meet water quality ARARs. The success of the treatments would be evaluated at five year intervals. If water quality improvements are occurring, no further actions would be taken except monitoring. If water quality is not improving, or doesn't appear to be able to meet ARARs, further remedial actions would be considered, including the diversion of Dolly Creek around the tailings area (Alternative 3). Alternative 3 would be expected to reduce the amount of contaminants entering Little Grizzly Creek from Dolly Creek, but water treatment would still be required to reduce metal concentrations in the leachate water from the tailings material. Alternative 3 would reduce the amount of contaminated water flowing to Little Grizzly Creek, but may not reduce the amount of contaminants released from the site to Little Grizzly Creek without the wetland water treatment system.

Alternatives 4 and 5 are expected to help reduce acid generation and the release of contaminants to leachate water. By themselves they would not meet ARARs, but do address the human health hazards caused by inhalation of dust from the site. It is expected that Alternative 4 or 5 would begin reducing acid generation in less than ten years.

The evaluation of the ability of the alternatives to comply with ARARs includes a review of chemical and physical specific ARARs plus action items to prevent human exposures. These were presented earlier in this report. There are no known location-specific ARARs for this site.

Long-term Effectiveness and Permanence

The treatment of Dolly Creek with either Alternative 2 or 3, PLUS the treatment of the remainder of tailings area with either Alternative 4 or 5 provides the highest degree of long-term effectiveness and permanence, treating all known contaminant pathways plus the generation of contamination over the entire site. If either Alternative 2 or 3 is implemented alone, only partial treatment would be provided, leaving natural mechanisms to treat the remainder of the site. The implementation of either Alternative 4 or 5 alone would not meet water quality goals, no matter how long they are in place.

Long-term protection of human health would best be achieved by institutional controls if either Alternative 2 or 3 is implemented alone. Institutional controls could be terminated after site stabilization if either Alternative 4 or 5 is implemented along with Alternative 2 or 3.

There is no evidence that there is any long-term advantages between Alternatives 2 and 3 at this time. Monitoring water quality is expected to give the evidence needed to consider the installation of the diversion structures in Alternative 3.

It is expected that both Alternative 4 and 5 would meet project goals, although it is estimated that Alternative 5 would require at least 30 years to become fully effective. Acid generation and mobility of contaminants would be reduced by site stabilization and reduced oxygen in the vadose zone. Passive treatment of water leaving the site would eliminate release of contaminants leaching to Dolly Creek, or, at least, reduce them to acceptable levels.

The difference between Alternatives 4 and 5 is the time of effectiveness and probability of success. Alternative 4 would address the entire treatment area at once, but would not use any soil amendments. It would rely solely on the use of proper vegetation and planting techniques. Alternative 5 creates islands of soil where revegetation is expected to flourish, then it relies on the spread of that vegetation between the islands, finally covering the entire site. Since wind erosion would be controlled, vegetation spread is expected to occur, but slowly. Revegetation of the entire site would probably not be as thorough as in Alternative 4 and, therefore, less effective in the long-term. Both alternatives are expected to be permanent, requiring little maintenance after final vegetation establishment. Institutional control of public access to the site would be required to protect rehabilitation features and plants until the site has become fully rehabilitated.

The stabilization of Dolly Creek would be permanent, but would require 5-10 years of maintenance. The wetland would require long-term (greater than 30 years) maintenance to facilitate its effectiveness. Monitoring water quality would also occur as a long-term element to ensure that all treatments are functioning properly and ARARs continue to be met.

Reduction of Toxicity, Mobility, or Volume Through Treatment

TOXICITY: Copper and zinc toxicity in Dolly Creek and Little Grizzly Creek is expected to be reduced to levels required by the Central Valley Regional Water Quality Control Board by reducing the amount of copper and zinc released into these streams. All alternatives, except Alternative 1 (No Action), would reduce the release of copper, but in different ways.

Alternatives 2 and 3 would reduce the transport of copper that is attached to sediment particles by stabilizing the Dolly Creek channel and its gully. Both alternatives would then treat Dolly Creek water and the tailings leachate by passing the water through a constructed wetland. In addition, Alternative 3 would divert the lesser contaminated water of Dolly Creek around the tailings area, discharging it into Little Grizzly Creek. Leachate water flowing from the tailings into Dolly Creek below the diversion would be treated by the constructed wetland. Without the full flow of Dolly Creek, the wetland size would be much smaller than needed for full treatment of leachate water, and the level of the aquifer now maintained at near the level of the sediment dam may drop during the drier season of the year, exposing more tailings material to oxygen and acid generation.

Alternatives 4 and 5 would reduce the release of copper to Dolly Creek by reducing the generation of acid within the tailings vadose zone. Much of the oxygen needed for the production of acid would be consumed by decomposing organic debris. The difference between these alternatives is the length of time for this process to become fully effective. Alternative 4 is expected to take much less time to become fully effective (approximately 10 years) than Alternative 5 (approximately 30 years).

Blowing sand and dust (containing crystalline silica particles) would be reduced or eliminated by implementing either Alternatives 4 or 5. Both alternatives would reduce or eliminate dust emanating from the site, but again, Alternative 4 would be expected to become fully effective much sooner than Alternative 5. Wind erosion control features would be installed with the implementation of either alternative. These devices are expected to reduce the transport of sand and the generation of dust to very low levels, but need to be replaced by plants for long-term success. Alternative 4 would require maintenance of these devices for approximately 10 years, while Alternative 5 would require approximately 30 years.

MOBILITY: The constituents of concern are sediment, blowing sand and dust, and metals in solution (copper and zinc). As discussed above, Alternatives 2 and 4 are expected to best control the release and transport of these constituents.

VOLUME: None of the alternatives reduce the volume of tailings material. All material would be treated on-site.

GENERAL DISCUSSION: As mentioned in the previous section, both Alternative 4 and 5 would reduce wind erosion and airborne contaminants. Vegetation growing over the tailings area is expected to reduce oxygen in the vadose zone of the tailings material by normal plant respiration processes as roots and other organic matter decomposes, thereby reducing the generation of acid and

mobilization of copper and zinc, the primary contaminants released from the site.

The wetland would be relied upon to extract soluble copper and zinc (plus other metals if released), transforming them into inert precipitates. Some of the metal contaminants would be taken up by the plants. The effectiveness of the wetland is expected to vary with the seasons and the amount of water required to be treated. Raising the elevation of the tailings dam about one foot may be needed to facilitate wetland establishment and size.

Stabilizing Dolly Creek is expected to reduce sediment production to acceptable levels or lower. This would reduce the release of copper and zinc from sediment to downstream areas.

Remediation of Air Quality. Concentrations of total crystalline silica are present in the tailings dust at levels of 19-23 percent. Silicosis, lung cancer, and secondary respiratory infections could result from repeated exposure to the dust. It is not known what the lower level of human exposure is, although respiratory effects are usually documented after occupational exposure to silica concentrations for several years. Expected results of implementing either Alternative 4 or 5 is the near total reduction of dust generated at the site. The near total reduction of fugitive dust at the site is expected to take approximately 10 years if Alternative 4 is implemented and 30 or more years with Alternative 5.

Remediation of Water Quality. Recent concentrations of copper and zinc at the compliance station for water quality (located downstream from the confluence of Dolly Creek with Little Grizzly Creek) ranged from 0.036 mg/L to 0.14 mg/L for copper and 0.0044 mg/L to 0.013 mg/L for zinc. The synergistic affect of copper and zinc on aquatic biota is well documented. For this reason, the water quality goal at the compliance station has been established for copper plus zinc at a concentration not to exceed 0.01mg/L. Examining the recent concentrations of copper and zinc, copper plus zinc has ranged from 0.040 mg/L to 0.15 mg/L. These concentrations are lowest during the high runoff and winter (cold) months and highest during mid-summer months.

Even though copper is required in animal metabolism, concentrations in fresh water above 0.01 mg/L (dependent on the alkalinity of the water) can have adverse effects, especially to the young or juvenile forms of aquatic animals.

Alternatives 2 and 3 include water treatment using a basic compost wetland, which is expected to remove copper and zinc from Dolly Creek to near background levels if properly maintained. Walker Mine, the primary source of copper to Dolly Creek and Little Grizzly Creek for many years, was sealed in November, 1987, reducing copper and zinc levels in Dolly Creek above the tailings area to near background levels during most of the year. Some copper is still released from the site; not from the sealed tunnel, but rather the waste rock and contaminated soil areas at the mine and milling sites. This problem is currently being addressed by the CVRWQCB and is expected to be remediated in the near future, possibly by 1995. The existing source of copper and zinc is leachate water that moves from the tailings material into Dolly Creek as it flows across the tailings area.

Since the primary source of copper, the mine portal, has apparently been successfully treated, only the small amount of copper and zinc released from the tailings material and the mine site remains. The mine site will soon be treated. Passive water treatment using a wetland should successfully remove the remaining copper and zinc without specialized wetland treatment technology. Periodic maintenance will require removing and treating contaminated soil, compost, and plant material and rejuvenating the wetland to its proper size and replacing lost compost and plant material. Structures designed to slow water movement will have to be replaced periodically, but should last longer than 30 years. Since iron is usually below the water quality objective of 1.0 mg/L and pH values are always near neutral, the use of an anoxic limestone drain for iron removal and neutralization is not warranted.

Proper wetland functioning also relies on active plant and bacterial metabolism, which is highest during the active growing season. This is also when the concentrations of copper and zinc in the receiving water are highest. Winter months will result in lower wetland activity and lower copper and zinc concentrations, because of dilution and lower activity of the mechanisms that cause release of the metals in the first place.

Revegetation of the tailings area will not only reduce wind erosion and the generation of fugitive dust, but it will also reduce the release of copper and zinc (and any other metals that could become mobilized over the years) by reducing the amount of oxygen in the vadose zone (the oxygenated zone between the top of the water table and the top of the tailings). This will reduce the release of copper and zinc to Dolly Creek and the amount of these metals to be removed by the wetland. An estimated reduction of metal mobility has not been made, but monitoring the several wells already installed in the tailings should give some indication of the relative changes in metal mobility achieved.

Short-Term Effectiveness

The implementation of Alternative 2 plus 4 is expected to have the greatest short-term effectiveness by treating all pathways and providing immediate reduction of respirable silica dust. Some particulate emissions is anticipated during the implementation of all alternatives, however, and proper respirators would be required to be worn by all workers whenever dust conditions warrant.

Implementability

Alternative 3 treatments are the same as Alternative 2 with the addition of the diversion works. This is an additional construction and maintenance complication.

Alternative 4 and 5 require similar wind erosion control features and installation requirements. Alternative 4 revegetation would be the simplest to conduct. Alternative 5 would require importing soil and construction of islands, mulch, and vegetation. The location of these islands would be critical for aiding the spread of plants to adjacent areas.

All alternatives use proven techniques and readily available services and materials.

The implementation of Alternative 3 with Alternative 5 would be the most complex to construct and maintain. The simplest treatment would be the implementation of Alternative 2 alone with institutional controls.

Cost

Alternative 2 alone has the lowest capital cost and Operation and Maintenance (O&M), but doesn't provide full site treatment and long-term effectiveness. The implementation of either Alternative 4 or 5 with either Alternative 2 or 3 would provide full treatment of the site. Mixing Alternative 2 with Alternative 4 would require a lower capital cost than mixing Alternative 2 with Alternative 5. The use of Alternative 3 would greatly increase the cost of treating the site, both in its capital cost and O&M cost. Additional work and expense could be required if revegetation doesn't meet expectations, increasing O&M costs over the estimates.

Combining Alternatives 2 and 4, provides the best overall effectiveness proportional to costs. The following table compares values and costs of each alternative. Refer to the Feasibility Study for a more detailed discussion.

ALTERNATIVE	30-YEAR NET VALUE	CAPITAL COST	O&M COST
1	$0	$0	$8,000
2	**$81,000**	**$240,000**	**$8,400**
3	-$21,000	$1,544,000	$20,400
4	**$63,000**	**$180,000**	**$4,200**
5	$42,000	$330,600	$1,400

State Acceptance

The State does not accept the No Action alternative. No "cease-and-desist order" for the site has been imposed on the Forest Service, but has been mentioned. Through conversations with State personnel, the CVRWQCB favors those alternatives that more completely treat the site and as quickly as possible. They favor most the proposed plan, discussed in section X, below.

Community Acceptance

Very few responses were received from the public. Of the responses received, most were informal and favored implementation of the proposed plan. No formal response was received from those who oppose work at the site. Through informal channels, it was learned that several people who use the site for off-highway vehicle recreation would prefer that the site remain as it is and that it remain open for their use.

Table 3 summarizes the advantages and disadvantages of each alternative.

X. The Proposed Treatment Plan and Modifications

The assembled remedial action alternatives represent a range of distinct waste management strategies which address human health and environmental concerns associated with the site. They build on one another, enhancing each other,

TABLES

except the no action alternative. The ability of each alternative to meet ARARs and the other evaluation criteria, discussed in the previous section, was evaluated.

Alternative 2 was selected in combination with Alternative 4 (Channel Erosion Control and Development of a Wetland for Passive Water Treatment + Revegetation and Wind Erosion Control) as the "preferred treatment". By analyzing the alternatives using the evaluation criteria discussed in the previous section, Alternative 2 plus Alternative 4 were determined to permanently treat the entire site and best meet the remediation goals and objectives discussed in Section VIII in a timely and cost-effective manner. These alternatives also have the support of the State agencies overseeing these matters, the local communities, and most PRPs.

Because little rejection of the proposed treatment plan was received and no new information was introduced, no modifications to the proposed plan are made.

Because hazardous substances will remain at the site at levels above that allowed for unlimited use and unrestricted exposure, the Forest Service, in cooperation with the CVRWQCB, will review the remedial action no less often than every five years after initiation of the selected remedial action [(40 CFR 300.430, paragraph (f)(4)(ii) and (f)(5)(iii)(C)].

WALKER MINE TAILINGS TOTAL METALS CONCENTRATIONS

TABLE 1

SAMPLE	FOOTAGE	LITHOLOGY	pH	SULFATE	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Fe
			pH UNIT	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TTLC					500	500	10000	75	100	2500	8000	2500	
STLC					15	15	100	0.75	1.0	5	80	25	
DETECTION	WATER	mg/l	0.1	2.0	0.30	0.20	0.05	0.02	0.02	0.05	0 05	0.02	0.10
LIMIT	SOIL	mg/kg	0.1	2.0	15	10	2.5	1.0	2.0	2.5	2 5	1.0	2 5
W-1	10	O	4.5	62	ND	13	2000	ND	ND	2.6	11	480	42000
W-2	15	U	6.6	20	ND	15	1700	ND	ND	3.0	11	380	38000
W-3	15	U	7.8	29	ND	26	2100	ND	ND	3.4	17	1600	43000
W-4	15	O	4.5	80	18	16	1400	ND	ND	5.5	23	2700	52000
W-5	6	O	4.3	22	ND	27	2000	ND	ND	2.7	11	1100	35000
W-6	12.5	U	7.8	54	ND	ND	2700	ND	ND	2.6	12	660	41000
W-7	5	S	6.9	3.4	ND	17	60	ND	ND	2.8	7.7	20	8000
101	6	O	4.4	31	ND	ND	2000	ND	ND	ND	8.9	760	40000
101	10	O	4.1	58	ND	ND	1900	ND	ND	4.1	8.1	460	39000
101	15	O	4.2	67	16	ND	2200	ND	ND	3.8	7.3	730	37000
102	10	U	7.3	19	18	13	1400	ND	ND	ND	12	2000	32000
103	15	U	7.5	50	ND	ND	2300	ND	ND	ND	14	630	47000
104	25	S	7.7	8.3	ND	27	340	ND	ND	28	15	62	47000
105	5	U	7.7	38	ND	ND	3400	ND	ND	3.5	13	590	36000
106	15	U	5.7	140	ND	42	2800	ND	ND	5.3	18	720	37000
107	10	U	8.1	19	ND	24	2800	ND	ND	ND	11	550	28000
W-3	QA/QC	WATER	1.6*	3.1	ND	ND	0.66	ND	ND	ND	ND	0.36	7.7

O = OXIDE TAILINGS

U = UNOXIDIZED TAILINGS

S = SOIL

GS = GRANITIC SOIL

DG = DECOMPOSED GRANITE

* = WATER SAMPLE PRESERVED WITH HNO3

1000 EXCEED 10 TIMES STLC

EXCEED TTLC

STLC = SOLUBLE THRESHOLD LIMIT CONCENTRATION

TTLC = TOTAL THRESHOLD LIMIT CONCENTRATION

ND = NON DETECT

WALKER MINE TAILINGS TOTAL METALS CONCENTRATIONS

SAMPLE	FOOTAGE	LITHOLOGY	pH	SULFATE	Pb	Hg	Mo	Ni	Se	Ag	Th	V	Zn
			pH UNIT	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TTLC					1000	20	3500	2000	100	500	700	2400	5000
STLC					5.0	0.2	350	20	1.0	5	7.0	24	250
DETECTION	WATER	mg/l	0.1	2.0	0.10	0.0002	0.05	0.05	0.30	0.02	0.40	0.05	0.05
LIMIT	SOIL	mg/kg	0.1	2.0	5.0	0.05	2.5	2.5	15	1.0	20	2.5	5.0
W-1	10	O	4.5	62	72	0.17	ND	4.2	ND	2.5	ND	36	77
W-2	15	U	6.6	20	38	0.28	ND	ND	ND	1.2	ND	33	90
W-3	15	U	7.8	29	94	0.44	ND	3.5	ND	3.0	ND	41	86
W-4	15	O	4.5	80	400	1.3	ND	3.0	ND	1.7	143	53	200
W-5	6	O	4.3	22	140	0.59	ND	ND	ND	4.6	ND	38	72
W-6	12.5	U	7.8	54	78	0.25	ND	ND	ND	1.6	ND	33	77
W-7	5	S	6.9	3.4	ND	ND	ND	2.8	ND	ND	ND	14	25
101	6	O	4.4	31	54	0.17	ND	ND	ND	4.8	ND	34	49
101	10	O	4.1	58	54	0.18	ND	ND	ND	3.2	ND	33	67
101	15	O	4.2	67	23	0.27	ND	ND	ND	4.7	ND	30	49
102	10	U	7.3	19	87	0.18	4.0	ND	ND	5.1	ND	28	91
103	15	U	7.5	50	54	0.40	ND	3.0	ND	2.3	ND	43	78
104	25	S	7.7	8.3	15	ND	ND	15	ND	ND	ND	97	66
105	5	U	7.7	38	110	0.41	ND	2.9	ND	1.6	ND	34	78
106	15	U	5.7	140	120	0.21	ND	5.4	ND	2.3	ND	41	300
107	10	U	8.1	19	110	0.29	ND	ND	ND	1.9	ND	31	73
W-3	QA/QC	WATER	1.6*	3.1	ND	ND	ND	ND	ND	ND	ND	ND	0.19

O = OXIDE TAILINGS

U = UNOXIDIZED TAILINGS

S = SOIL

GS = GRANITIC SOIL

DG = DECOMPOSED GRANITE

* = WATER SAMPLE PRESERVED WITH HNO3

1000 EXCEED 10 TIMES STLC

[redacted] EXCEED TTLC

STLC = SOLUBLE THRESHOLD LIMIT CONCENTRATION

TTLC = TOTAL THRESHOLD LIMIT CONCENTRATION

ND = NON DETECT

27502/732
August 18, 1993
WELSH ENGINEERING SCIENCE & TECHNOLOGY, INC.
WM-01-92

REPORT OF FINDINGS UNDER PROGRAM NO. 91-017
BY THE U. S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE, PLUMAS NATIONAL FOREST
FOR THE RECEIVING WATERS AT WALKER MINE TAILINGS, PLUMAS COUNTY
MAY, 1993

TABLE 2

Grab samples were taken and field tests made at five of the six prescribed sampling sites. Sample site R-6 was dry. All samples were tested in certified laboratories using the techniques prescribed in the Waste Discharge Requirements, Order No. 91-017. Water discharge, water and air temperature, specific conductance, and pH were measured in the field at the time of sampling. Test results are as follows:

MAY, 1993

Receiving Water Constituent	----Stations[1]--- R-1	R-2	R-3	R-4	R-5	R-6	Limitations
Discharge (cubic feet/sec.)	7.28	7.28	39.6	44.7	46.1	0.00	
Air Temperature (°C)	12	10	8	14	11		
Water Temperature (°C)	9	14	7	9	10		
Conductivity (micromhos/cm)	60	80	40	4	40		
pH (pH units)	7.6	7.8	7.4	7.7	7.6		6.5-8.5
Hardness (CaCO3) (mg/l)	25	28	18	16	17		
Alkalinity (CaCO3) (mg/l)	32	30	24	22	22		
Acidity (CaCO3)	1	1	1	1	3		
Suspended Solids (mg/l)	9.2	84.0	0.8	3.2	16.8		
Settleable Solids (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1		0.20
Turbidity (NTU)	0.10	0.25	0.05	0.15	0.05		
Bicarbonate (mg/l)	39	36	29	27	27		
Calcium (mg/l)	5.1	6.6	4.7	3.8	4.2		
Carbonate (mg/l)	<1	<1	<1	<1	<1		
Chlorides (mg/l)	<0.5	<0.5	<0.5	<0.5	<0.5		
Magnesium (mg/l)	2.9	2.8	1.5	1.5	1.6		
Potassium (mg/l)	0.8	1.0	0.6	0.7	0.7		
Nitrate as N (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0		
Sodium (mg/l)	1.9	2.1	2.2	2.4	2.2		
Sulfates (mg/l)	0.5	4.0	<0.5	<0.5	<0.5		
Dissolved Solids (mg/l)	42	56	32	29	37		

Receiving Water Constituent	----Stations[1]--- R-1	R-2	R-3	R-4	R-5	R-6	Limitations
Chromium (ug/l)	<10	<10	<10	<10	<10		
Arsenic (ug/l)	<10	<10	<10	<10	<10		
Mercury (ug/l)	<1	<1	<1	<1	<1		2.4
Selenium (ug/l)	<5	<5	<5	<5	<5		
Aluminum (mg/l)	ND	0.16	ND	ND	ND		0.750
Antimony (mg/l)	ND	ND	ND	ND	ND		
Cadmium (mg/l)	ND	ND	ND	ND	ND		0.0053[2]
Chromium (mg/l)	ND	ND	ND	ND	ND		
Copper (mg/l)	0.11	0.37	ND	ND	0.036		0.0034[2]
Iron (mg/l)	0.09	0.59	0.06	0.06	0.11		1.00
Lead (mg/l)	ND	ND	ND	ND	ND		0.010[2]
Manganese (mg/l)	ND	0.11	ND	ND	ND		
Nickel (mg/l)	ND	ND	ND	ND	ND		
Silver (mg/l)	ND	ND	ND	ND	ND		
Thallium (mg/l)	ND	ND	ND	ND	ND		
Zinc (mg/l)	0.0080	0.0240	0.0063	0.0026	0.0044		0.026[2]
Dissolved Organic Carbon (mg/l)	2.2	2.0	2.3	2.2	2.4		

1. R-3 is the background station located above the tailings area on Little Grizzly Creek. R-5 is the Waste Discharge Requirement(WDR) compliance station and is located downstream from the confluence of Dolly Creek and Little Grizzly Creek near Brown's Cabin.

2. The compliance value for cadmium, copper, lead, and zinc is calculated with hardness from background station R-3 .

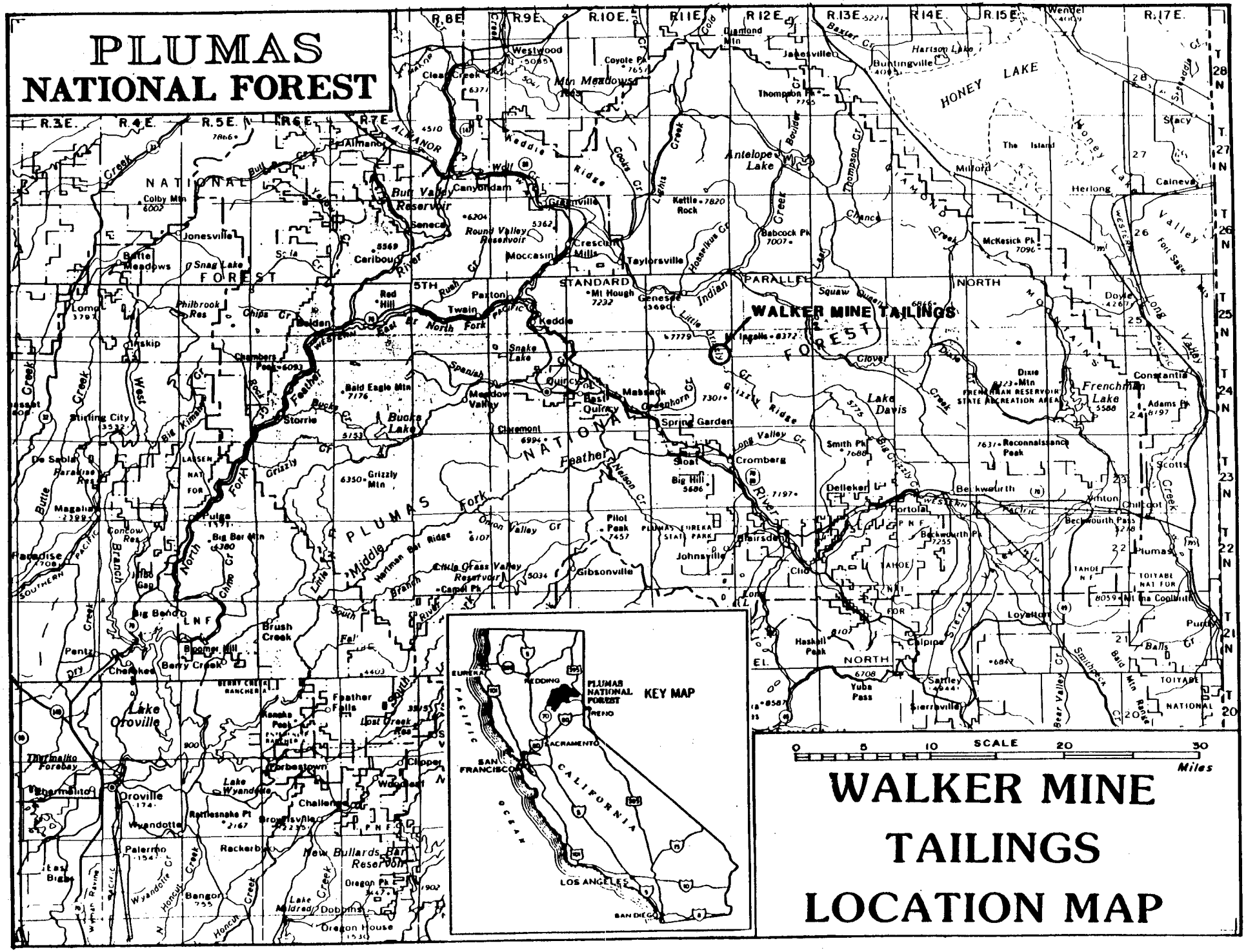
SUMMARY OF DETAILED ANALYSIS OF TREATMENT ALTERNATIVES FOR THE WALKER MINE TAILINGS

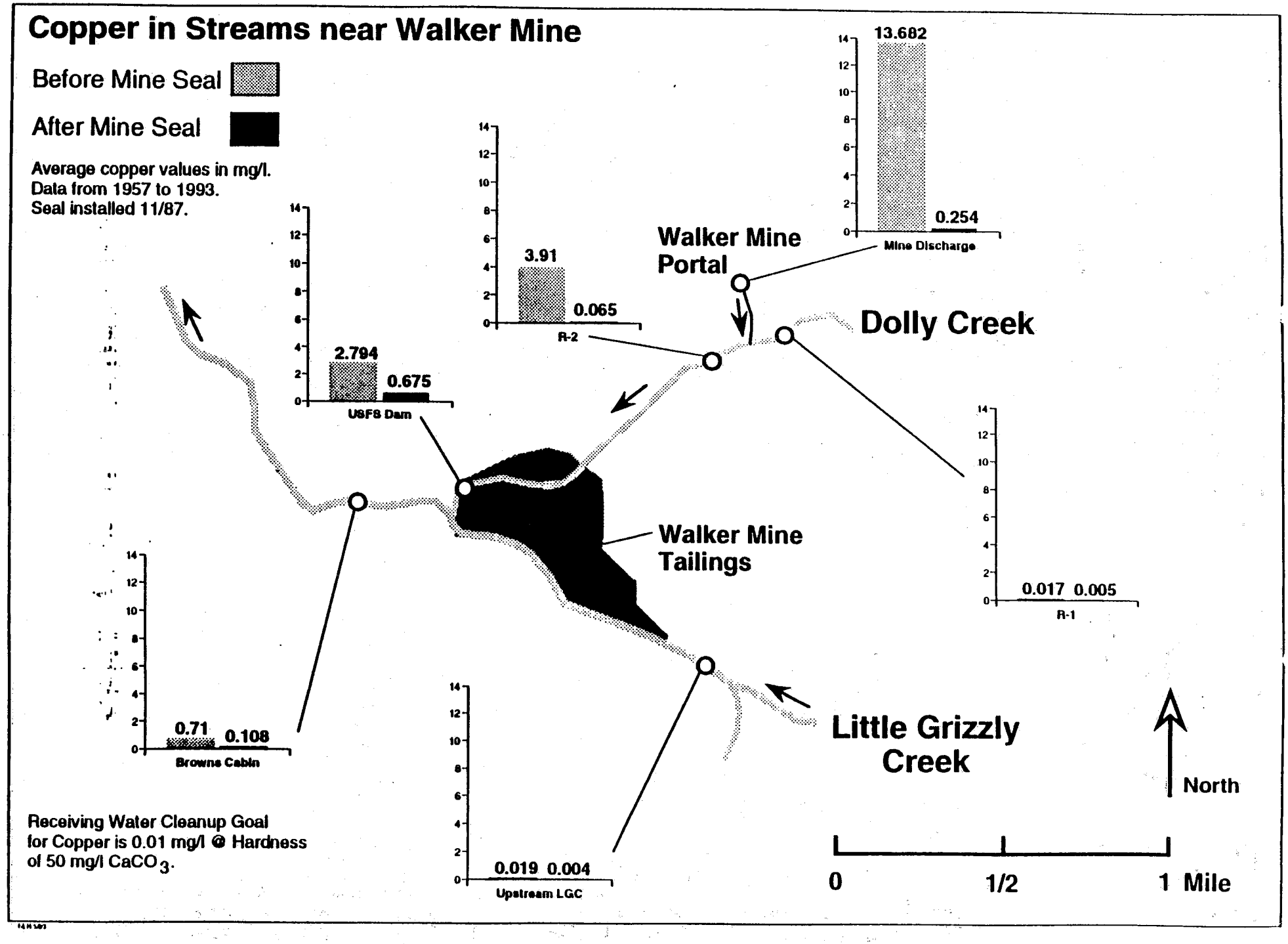
TABLE 3

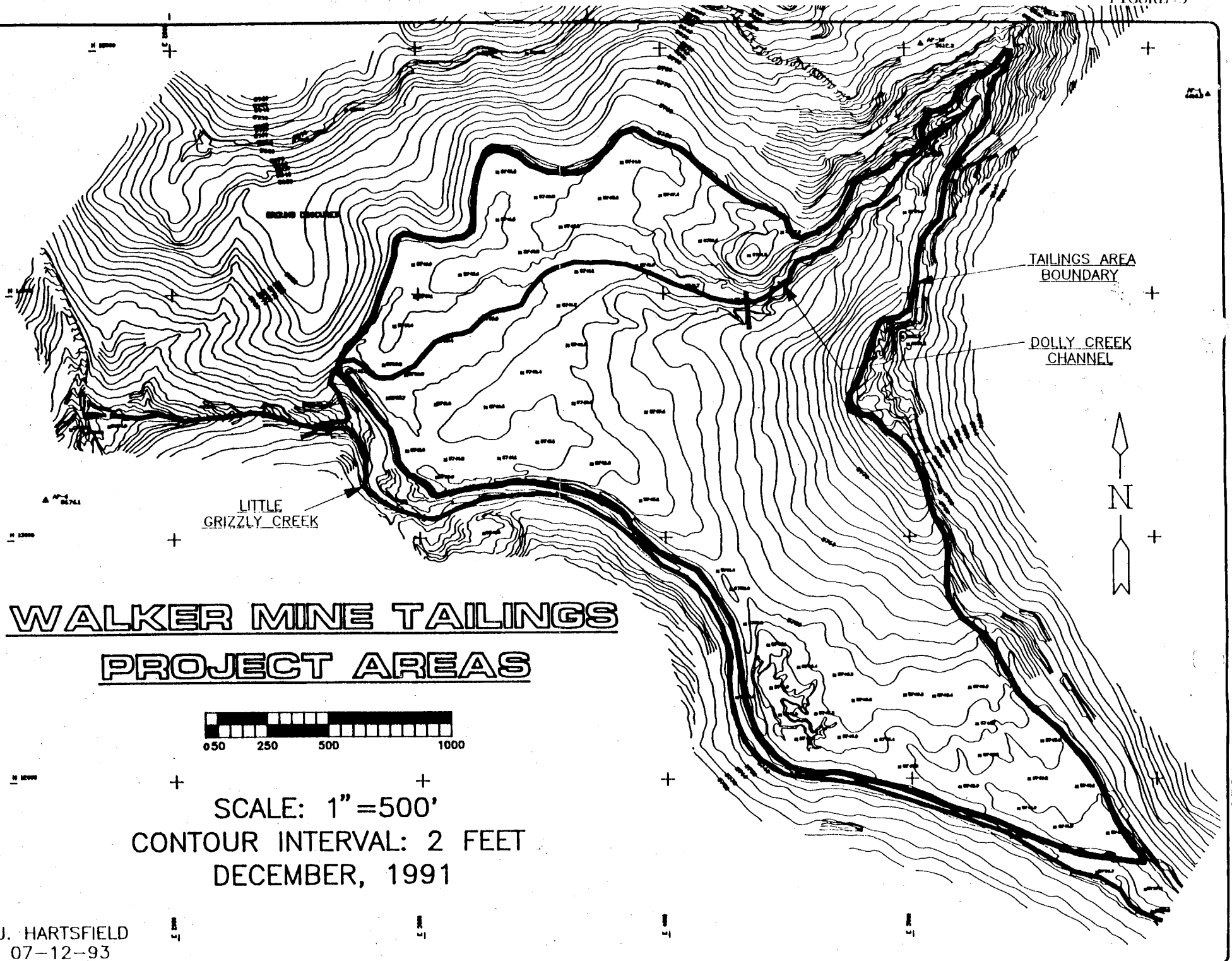
EVALUATION CRITERIA	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: CHANNEL STABILITY + WETLAND	ALTERNATIVE 3: ALT 2 + DIVERSION OF DOLLY CREEK	ALTERNATIVE 4: REVEGETATE + WIND EROSION CONTROL	ALTERNATIVE 5: VEG. SOIL ISLANDS +EROSION CONTROL
1. Overall Protection of Human Health and the Environment	No action taken. Not considered to be protective of human health and the environment	Would not reduce human health risks, but would reduce the release of copper to environment.	Would not reduce human health risks, but would reduce the release of copper to environment.	Would reduce human health risks, but would only aid in the reduction of Cu release to environment.	Would reduce human health risks, but would only aid in the reduction of Cu release to environment.
2. Compliance with ARARs	No action taken. Not considered to be in compliance with ARARs.	Both physical and chemical water quality requirements would be met. Would not reduce human health risks.	Both physical and chemical water quality would be met. Would not reduce human health risks.	Would only aid in meeting water quality ARARs. Would reduce human health risks from inhalation of silica dust.	Would only aid in meeting water quality ARARs. Would reduce human health risks from inhalation of silica dust.
3. Reduction of Toxicity, Mobility, and Volume through Treatment	No action taken. Not considered to reduce toxicity, mobility, or volume of hazardous material.	Copper release would be reduced to acceptable level. Sediment release would be minimal. Would not reduce the release of air borne silica dust.	Copper release would be reduced to acceptable level. Sediment release would be minimal. Would not reduce the release of air borne silica dust.	Would reduce copper in the leachate draining to the wetland to an unknown level within 10 years. Would reduce air borne contaminants to acceptable levels within 10 years.	Would reduce copper in leachate draining to the wetland to an unknown level within 30 years. Would reduce air borne contaminants to acceptable levels within 30 years.
4. Short and Long-term Effectiveness	No action take. Not considered to reduced environmental impacts or risks of exposure	Potential risk to workers from silica dust inhalation reduced by use of protective equipment. Long-term monitoring and maintenance would insure good channel stability and wetland functioning.	Potential risk to workers from silica dust inhalation reduced by use of protective equipment. Long-term monitoring and maintenance would insure good diversion ditch, channel and wetland functioning.	Potential risk to workers from silica dust inhalation reduced by use of protective equipment. Long-term monitoring and maintenance would insure success of revegetation.	Potential risk to workers from silica dust inhalation reduced by use of protective equipment. Long-term monitoring and maintenance would insure success of revegetation.
5. Implementability	No action taken. Water monitoring would still occur.	State-of-the-art techniques would be used. No special permits or labor would be required.	State-of-the-art techniques would be used. The diversion ditch would follow standard engineering protocol. No special permits or labor would be required.	Locally available material would be used for wind erosion control. Native plants adapted to the site would be planted Planting should be phased over 3 years. Full site occupation would take 10 years.	Locally available mate would be used for wind wind erosion control. Native plants adapted to site would be planted onto islands of imported soil. Planting would take place in a single year if funded Full site occupation would take 30 years.
6. Cost	No action taken. Cost to monitor water quality only.	$240,000 capital cost $8,400 annual O&M	$1,554,000 capital cost $20,400 annual O&M	$180,000 capital cost $4,200 annual O&M	$330,600 capital cost $1,400 annual O&M
7. Degree of Regulatory Acceptance	Low	Acceptable	Acceptable	Acceptable	Acceptable

FIGURES

FIGURE 1


PLUMAS
NATIONAL FOREST
WALKER MINE TAILINGS
KEY MAP
PLUMAS NATIONAL FOREST
SCALE
0 5 10 20 30
Miles
WALKER MINE
TAILINGS
LOCATION MAP


Copper in Streams near Walker Mine
Before Mine Seal
After Mine Seal
Average copper values in mg/l.
Data from 1957 to 1993.
Seal installed 11/87.
13.682
0.254
Mine Discharge
Walker Mine Portal
3.91
0.065
R-2
Dolly Creek
2.794
0.675
USFS Dam
Walker Mine Tailings
0.017 0.005
R-1
0.71
0.108
Browns Cabin
0.019 0.004
Upstream LGC
Little Grizzly Creek
North
0
1/2
1 Mile
Receiving Water Cleanup Goal for Copper is 0.01 mg/l @ Hardness of 50 mg/l $CaCO_3$.



WALKER MINE TAILINGS PROJECT AREAS

SCALE: 1"=500'
CONTOUR INTERVAL: 2 FEET
DECEMBER, 1991

J. HARTSFIELD
07-12-93

FIGURE 3

APPENDIX

United States Department of Agriculture | Forest Service | SO

Reply to: 2110/2120 Date: July 1, 1993

Subject: Public Meetings to Present Proposed Treatments at the Walker Mine Tailings

To: District Ranger, Beckwourth RD

Two meetings were held to receive comments and concerns from the community regarding proposed treatments for the Walker Mine Tailings. This letter documents the outcome of those meetings.

The meetings were conducted by representatives from the Forest Service, the Central Valley Regional Water Quality Control Board, and the Plumas Corporation.

The first meeting was held June 23 in Taylorsville. Taylorsville is located on Indian Creek downstream from Little Grizzly Creek and the Walker Mine Tailings. The reason for selecting Taylorsville for the meeting place was to solicit comments from those people most affected by changes in water quality due to the proposed treatments at the tailings area.

Two people attended the meeting, one from the community and one outside. The person from the community was concerned that the site may be mined in the future, destroying treatments implemented at the site. He believes that we should treat the site as soon as possible.

The second person expressed concern that any treatments implemented at the site at this time not preclude future treatments as technology advances and more permanent treatments are made available. Upon review of the proposed treatments, his concerns were satisfied. The proposed treatments would not preclude such treatments if they prove reliable and economical.

The second meeting was held June 30 in Portola. Portola was chosen for this meeting to solicit comments and concerns from Off Highway Vehicle (OHV) users who may be frequenting the site and who would be concerned about the site being closed to their use. Over 200 letters were sent out prior to the meetings to interested parties, including a large OHV constituency, to coax them into attending one of the meetings. The meetings were also announced in the local newspapers.

Three members of the community attended the second meeting plus two people from the Plumas County Health Department. Three concerns surfaced. There was a concern that future technologies not preclude future treatments. A tag on concern is that future treatments should provide a boost to the local economy, specifically Portola.

The third concern was pressed by the County Health D irtment representatives over the potential hea_h hazardous of workers and the public exposed to dust from the tailings area. The County Health Department was unaware that the public was using the area for OHV play and they expressed an opinion that the area be posted with health warning signs.

Because dialogue concerning the closure of the site to OHV use did not occur at either of the meetings, and because it is assumed that some OHV users will ignore signs and gates warning of the health risks and need to stay off the site, an information brochure was suggested. The brochure could be made available to all users of the site, including those who violate closure signs and gates.

No other comments were received and it is assumed that we have acceptance from the majority of the local communities.

Terry A. Benoit

TERRY A. BENOIT
Forest Hydrologist

United States Department of Agriculture | Forest Service | SO

Reply to: 2110/2120 Date: September 27, 1993

Subject: Phone Conversation with Mr. Archie Sparkman

The following key points were discussed with Mr. Archie Sparkman, one of the claimants of the Walker Mine Tailings and a Potentially Responsible Party (PRP). He spoke for himself and the other claimants.

1. The assessment taxes haven't been paid for three years.

2. He and Buzz Lally are retired and were talked into this venture.

3. No work as been performed at the site. They've never performed any work at the site.

4. They are okay with the Forest Service proposal. He doesn't know anything about that type of work anyway.

5. He considers himself and the others as having dissolved their interest in the site three years ago.

Terry A. Benoit

TERRY A. BENOIT
Forest Hydrologist

United States Department of Agriculture | Forest Service | SO

Reply to: 2110/2120 Date: January, 1994

Subject: Documentation of Public and Agency Acceptance of Proposed Remediation Walker Mine Tailings Remediation Project

To: Files

PUBLIC RESPONSE. All formal response was received at the two public meetings and over the phone. I was able to gather information through other sources about how other people felt about the proposed project for Walker Mine Tailings. Except for Off-highway Vehicle (OHV) users who use the site, most people are in favor of the proposal. The primary people in favor live downstream of the tailings area and near Genessee. The OHV recreationists have expressed a desire that the area be left a playground and that no restrictions be placed on use of the area.

AGENCY RESPONSE. The primary agency we are dealing with in the treatment of the site is the Central Valley Regional Water Quality Control Board (CVRWQCB). Mr. William Croyle, Water Quality Engineer working for the Board, is my primary contact. Through him I have learned that the CVRWQCB is okay with the preferred treatment plan (Alternative 2 + Alternative 4). They are most interested in our attempt to show a good faith effort with good science.

Our attempt to obtain a formal response from them regarding their acceptance of the proposed treatment plan resulted in no response. We attempted to solicit their approval/disapproval by asking for criticism of the Proposed Plan.

No other responses have been received, except from miners who always seem to have a new and innovative approach to our problem and, it just so happens, to their gain.

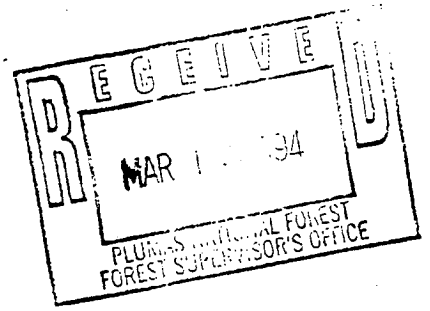
Terry A. Benoit

TERRY A. BENOIT
Forest Hydrologist

ARCO

555 Seventeenth Street
Denver, Colorado 80202
Telephone 303 293 4900

RSU



March 10, 1994

H. Wayne Thornton
Forest Supervisor
Plumas National Forest
P. O. Box 11500
Quincy, California 95971-6025

VIA FACSIMILE
HARD COPY TO FOLLOW

RE: WALKER SITE

Dear Mr. Thornton:

Thank you for your February 14, 1994 letter providing ARCO with additional time to respond to your January 5, 1994 letter. Your summary of respective responsibilities of the Forest Service and the Central Valley Regional Water Quality Control Board for the Walker Mine Site and the Tailings project was helpful. Given that the Forest Service's responsibility is for the Tailings project, and your January 5th letter seeks our response on only that subject, we confine our response to the tailings area project.

First, we appreciate the straightforward and pragmatic approach that the Forest Service seems to be taking to the tailings remediation project. As you know, ARCO has been asked to participate at a fairly late stage in the process and therefore has been working hard to get up to speed as to the work at the site by the Forest Service and other parties. From my conversation with Terry Benoit, I understand that remediation activities will commence this summer.

Although we understand the basic remediation goals set by the Forest Service, we would like to obtain additional information about past studies at the site and the interrelationship between the mine site and the tailings project. I also would like information such as prior studies by EPA or other parties towards National Priorities List evaluation for the site, the relative roles of the agencies at the site, the nature of previous water quality proceedings and adit sealing activities.

We are also interested in additional information about other parties who may have had past involvement in the site. From our preliminary review of records for this property a number of entities appear in the chain of title. Has the Forest Service assessed the potential liabilities of other parties such as Safeway Signal, Union Bank & Trust of Los Angeles, Plumas Land Company, Plumas Mining Company, Plumas Lumber Company

and California Trust Company? Will these or other entities also participate in the proposed remediation project?

With these issues still being reviewed, and with the law still evolving on the extent of corporate control required to establish responsible party status under CERCLA, ARCO must remain somewhat tentative about the nature and scope of its participation in the cleanup process described in your January 5th letter. For instance, it is difficult for ARCO to identify the type of participation that might be appropriate absent a better understanding of the jurisdictional overlap between local, state and federal agencies, and the extent to which the Forest Service could provide appropriate releases or other covenants to ARCO should it commit financially to the project. We will need to evaluate these issues. Yet in light of the pragmatic approach the Forest Service has adopted for this project, and the fact that ARCO has experience to contribute on projects of this nature, we are willing to participate in the process of developing the proposed treatment plan into a record of decision and its final implementation. We look forward to working with you to identify the appropriate scope of that participation.

To move forward then, I propose the following steps. I will contact Mr. Benoit to address the various issues raised in this letter. ARCO will continue to compile and examine information about the historical activities of IS&R. and others. I then suggest we arrange a meeting and site visit to discuss ARCO's participation in the project. In the meantime, please call me if you have any questions.

Sincerely,

Christiane C. Garlasco
Superfund Coordinator
(303) 293-4085

CCG/jk